

Section Sciences et Ingénierie de l'environnement Design Project 2020 (semestre de printemps)

Proposition n°6

Development of a multipath mitigation method for enhancing the map accuracy

Partenaire externe

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Tom Tom

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Taille de l'entreprise (nombre de collaborateurs) : ~ 5000

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Project description

TomTom is a leading location technology specialist active worldwide, headquartered in Amsterdam. Among products that TomTom develops, the TomTom HD (high definition) Map is a highly accurate representation of the road (including lane geometry, lane models and traffic signs), with accuracy down to a few centimetres. These maps are used by the automotive industry for deploying automated driving.

The HD map making process involves a fleet of vehicles driving around for collecting data. These vehicles are equipped with high-end sensors (GNSS receiver, GNSS antenna, LiDAR and camera). We are collecting data in complex environments, such as dense cities with tall buildings and mountainous landscape. The presence of buildings can deteriorate the performance of the GNSS receiver, due to shadowing and multipath effects. The performance of the GNSS receiver has a direct impact on the map quality. In this context, we are interested in studying the impact of multipath signals on the map accuracy and develop a method for filtering out the signals contributing to the degradation of the positioning solution.



Illustration 1: Mobile mapping vehicle

Objectives

The objectives of the project are the following :

- Investigate the effects of multipath on GNSS positioning for map production.
- Identify the regions that are the most at risk for undergoing multipath effect.
- Propose a method (one or more if suitable) for identifying the multipath signals reaching the GNSS receiver.
- Implement a method (post-processing) for filtering out the multipath components that are degrading the solution.
- Outline the potential benefits of such a method (accuracy gained, e.g.).

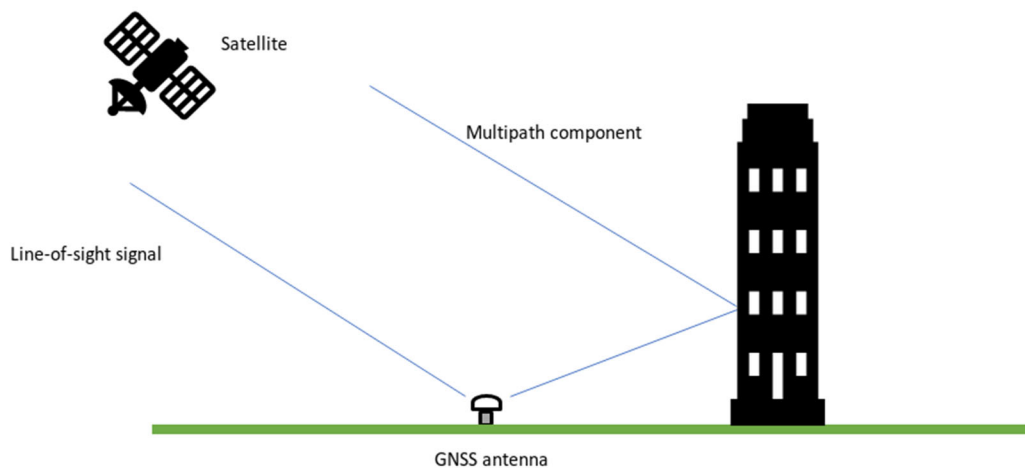


Illustration 2: Scenario with one multipath component

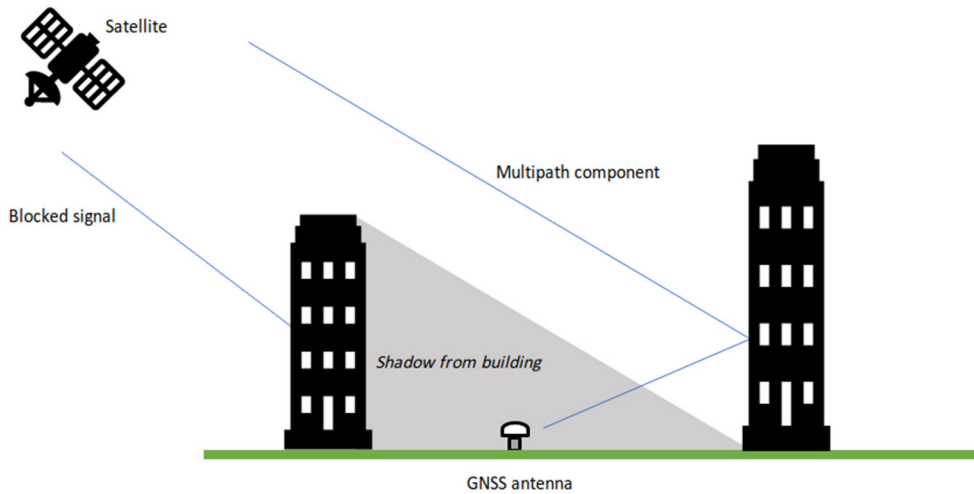


Illustration 3: Scenario with blocked signal

Tasks description

TomTom will provide the following data and materials :

- map data (*geopackages/shp files*) containing roads and building footprints,
- LiDAR point cloud,
- u-blox receiver (*complete kit with antenna*).

- Conduct small research on the effects of multipath and the currently available solutions for mitigating these effects.
- Get familiar with the provided data.
- Learn how to use a u-blox receiver and the post-processing software.
- Define an area of interest for carrying out the research.
- Organize a small field campaign for collecting data.
- Collect, treat and analyze the data.
- Implement the chosen method and test it.
- Present the results in a final report and presentation.

Miscellaneous

English is needed. Report and presentation will be delivered in English. As a prerequisite, it would be nice if students have taken the « *Localisation par satellite* » course or similar course, and that they are currently enrolled in “*Advanced Satellite positioning*”. The development and implementation will be done in python.